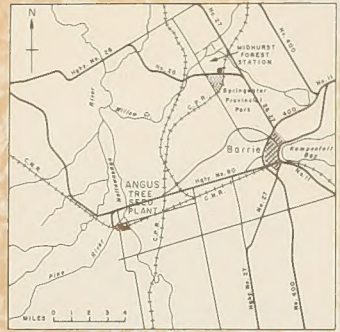
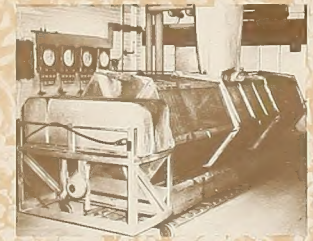


Each spring, if you look closely, you can see tiny flowers on pine and spruce trees. They both appear in cone-like clusters grouped around a woody axis. The sulphur-yellow pollen is carried by the wind to the female flowers which develop into seed-bearing cones. Pine cones take two years to develop, while spruce cones mature in one growing season. Above: white pine flowers, natural size. Left: male or staminate. Right: female or pistillate.

The Ontario Tree Plant at Angus.



Drums for drying cones in kilns.

Germination racks.

Germination test to determine viable seed.

THE ONTARIO TREE SEED PLANT

Ontario
Ministry of Natural Resources
Hon. James A. C. Auld, Minister
Dr. J. K. Reynolds, Deputy Minister

THE ONTARIO TREE SEED PLANT

The Ontario Tree Seed Plant is an essential link in establishing more productive forests for the future. It supplies seed for the production of nursery stock for planting on cut-over or burned-over lands and on idle lands on farms where new forests of good quality will not seed in naturally.

The seed plant was established in Angus in 1923 when the Ministry produced about one million seedlings annually. By 1972 almost 75 million trees were shipped from the ten provincial nurseries, and almost all the seed for these was processed at Angus. The new brick extractory building, housing modern equipment, is now geared to meet the demand for high-quality seed in increasing volume — sufficient to produce 150 million seedlings annually.

Approximately one-fifth of the nursery stock is supplied for planting on private land, primarily in southern Ontario. Red pine, white spruce, Scotch pine, white pine and white cedar are the species most in demand. Planting assistance, made available to landowners under The Woodlands Improvement Act, 1966, has increased this demand.

Each year a few million trees are planted on lands managed by the Minister of Natural Resources for municipalities and Conservation Authorities. The remainder of the nursery stock production is planted on Crown lands where natural seeding of desirable tree species does not replace those cut or destroyed by fire. The principle species planted are white and black spruce, and jack, white and red pine.

In addition, seed is supplied from Angus for direct seeding on Crown lands where scarification of the ground and broadcasting of seed is a more economical method of establishment in the initial stage than planting nursery-grown trees. Each year, many thousands of hectares are prepared for seeding and planting.

To meet these extensive demands for seed, the Angus plant has been required to process up to 18,000 hectolitres of cones every year, whenever they were available. From the collection of cones to the final nursery shipments, the program is under the direction of the Forest Management Branch of the Division of Forests.

Cone collection is complicated by the periodicity of crop years. For some tree species, there may be as many as five to seven years between good crops of cones. When the harvest is good, enough seed must be collected to last for several years. Fortunately, coniferous seed and some hardwood seed can be stored for several years under controlled conditions.

Seed collection and treatment must also take into consideration the fact that plantations normally thrive best when established with nursery stock that has been grown from seed collected from the local area. Cone collections are therefore made in the nine site regions into which the province is divided according to climatic conditions. The actual collections are made by pickers working under contract with the District Offices. Contracts are issued just before the cones begin to open to release the ripe seed.

From the forty-eight Forest Districts, the cones are shipped to the Ontario Tree Seed Plant. Here they are examined for quality, measured and recorded (to maintain identity as to species and site region), and placed in screened trays in cone-drying sheds. Air circulation throughout the sheds reduces the moisture content of the fresh cones. To speed up the drying process, the cones are turned over regularly with wooden paddles.

Extracting and further processing of seed are completed in the modern three-storey Extractory Building completed in 1963, with an addition in 1975. The top floor is the area where batches of air-dried cones are received pending extraction; revolving drums and kilns occupy the second floor; and on the ground floor are the seed cleaning equipment, heating plant and germination laboratory. From September until June is the normal period of operation.

When milling begins, the cones are poured through a chute into sixteen wire drums which, after being moved into place, revolve continuously within eight kilns (two drums to a kiln) on the second floor. The kilns provide a constant heat which causes the cones to open and release their seeds. The tumbling action of the drums shakes the seeds loose and drops them into hoppers. (This operation varies according to the species and the condition of the cones).

In the next step, the seed goes into rotating mixers which break the wings loose from the seeds. The light wings are sucked away through a suction pipe.

Next, the seed is spread on trays in drying cabinets. It is dried to the desired moisture content by a controlled flow of air at 27°C.

Now, the seed must be cleaned since it contains a considerable amount of "dirt" in the form of needles, resin and bits of cones. The "dirt" is removed by three machines.

First, the "scalper" sifts the seed over shaker screens of different mesh sizes which provide three separations: coarse dirt, seed with medium-size dirt, and fine dirt.

Second, the "fanning mill" drops the seed (with medium-size dirt) through a regulated flow of air. This blows away the dirt and hollow, light seed.

Third, the "needler" removes the little dirt remaining — a relatively few pieces of resin and needle of the same size and weight as the seed. The seed rides up a sloping canvas belt. The slope and tension of the belt is regulated so that irregular-shaped dirt rides up to the top and is dropped into a waste container, while the seed falls back to the bottom.

After the final cleaning, the seed is tested for moisture content since it must be dry if it is to remain viable throughout years of storage. When the seed is too wet, it is placed in drying cabinets until its moisture content is less than six per cent.

Clean, dry seed is stored in twenty-five litre plastic or glass containers, sealed air-tight. Along with a small, separate sample for testing, each container becomes an individual seed lot on inventory; it has its own identification number and a record of species, site region, year collected, weight, moisture content, and number of seeds per gram.

The containers are moved to the refrigerated vaults where the seed of more than eighty-five species is stored. The total weight of the seed is about 33,600,000 Kg, and the total value is approximately $2,500,000.00.

At the time of storage, each container of seed is tested for germination — the ability of the seed to sprout and grow. If it remains in storage, it is retested every second year. To maintain this program, laboratory technicians must conduct about 3000 double germination tests every year. This work is quite necessary since all shipments of seeds are calculated in terms of viable ("living") seeds.

Before the seed of most species can be tested, the seed dormancy must be broken. This is accomplished by stratification — seeds are stored on moist trays in a refrigerator at 3°C for one month. This is similar to the natural conditioning of seeds lying on the ground in early spring.

Seed samples are moved from the refrigerator to the germination laboratory. Here, they are exposed to fluorescent light for eight hours a day and grow in a constant temperature of 27°C. Two sets of germination test are made: first, the Jacobsen test on moist blotting paper; and second, the test on moist sand.

The germination tests show the number of seeds in the sample that germinate within a specific number of days. From this information, every seed lot is rated in terms of the number of viable seed per gram.

The Ontario Tree Seed Plant is engaged in developing new equipment and processing techniques that will improve the standard of the seed supplied from the plant.

The seed plant is also participating in the Tree Improvement Program which aims at the creation of seed orchards from which the seed of superior tree strains may be collected. This work applies particularly to white, red and jack pine and white and black spruce, the five species which account for 95 percent of seed requirements.

Natural and planted stands of superior trees have been selected and thinned to serve as seed production areas. The work of genetic improvement is specialized and requires a considerable amount of tree grafting and greenhouse work at the plant in Angus.

School classes and other interested groups are invited to visit the seed plant. To arrange for guided lecture tours, please apply to the Superintendent, Ontario Tree Seed Plant, Ministry of Natural Resources, Angus, Ontario.